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## GEOLOGIC SETTING OF THE LOWER HOVIN GROUP (ARENIG/LLANVIRN), HØLONDA AREA, SØR TRØNDELAG, NORWAY

The Hølonda area in the Scandinavian Caledonides has been of special interest to geologists since its fossils were first reported by Brøgger (1875). Two assemblages of Ordovician brachiopods were identified by Reed (in Kiær, 1932), the younger from one locality in the Upper Ordovician Hovin Sandstone, the older from several localities in the Hølonde Formation. The difference in their ages is reflected in Vogt's (1945) Lower Hovin Group and Upper Hovin Group, a distinction that is preserved in our classification of these rocks (the Table). The same distinction was recognized by Chaloupsky (1970, 1977) who used a different nomenclature.

In his summary of the brachiopods of the Hølonde Formation (of the Lower Hovin Group) Reed called attention to the «... special resemblances to American rather than European species...» (Kiær, 1932, p. 143), and Strand (in Kiær, 1932) noted that the trilobites in this formation had British-American affinities. The American affinities of these fossils were reaffirmed by Spjeldnæs (in Strand, 1960) who indicated their equivalence with the Whiterock Stage of Nevada (Spjeldnæs, 1961). Modern descriptions of the brachiopods and trilobites from one locality (Neuman, Bruton, 1974) confirmed the presence of North American genera here.

Following the terminology of Bruton and Bockelie (1980) derived from that of Vogt (1945), the Lower Hovin Group sequence appears to be confined to the upthrown (northwest) side of a thrust fault mapped by Chaloupsky (1977) and Bruton, Bockelie (1980) — the Horg fault of Walsh (1986). We correlate the Greenstone complex at the base of this sequence with the Løkken Formation, following Furnes et al. (1985) and Stephens, Gee (1985) rather than with the Støren Group as did Bruton, Bockelie and their predecessors. In the Løkken area, to the west of Hølonda, also on the upthrown side of the Horg fault, is a somewhat different sequence, part of which is coeval with the Lower Hovin Group. The Lo Formation of this sequence contains graptolites of Castlemain 2 to Yapeen 1 (mid-late Arenig) age and is older than any unit in the Lower Hovin Group. Ophiolitic rocks of the Løkken Formation, largely volcanics, contains mid- to late-Arenig graptolites in shale interbedded with pillow lavas. Black shale of the Bogo Formation, above the Løkken Formation, contains graptolites of Yapeen 3 to Darriwil 2 (late Arenig-early Llanvirn) age (Ryan et al., 1980; Schmidt, 1984), coeval with the Hølonda Limestone. The Nyplassen Formation, a heterogeneous unit of volcanoclastic and epiclastic rocks, has brachiopods in splintery, tuffaceous shale at one place that are like those of the Hølonda Limestone.

Thirteen brachiopod taxa are now known from Lower Hovin Group rocks at 15 places along 13 km of outcrop, 14 from calcareous siltstone associated with the Hølonda Limestone, and one from the Nyplassen Formation. Six of these (*Syndielasma*, *Aporthophyla*, *Rhysostrophia*, etc.) belong to the genera peculiar to assemblages of Whiterock age in Nevada,

	Chadwick et al., 1963	Ryan et al., 1980	This paper	Chaloupsky, 1977	Vogt, 1945
Caradoc-Ashgill		Hogknippen Formation  Ryanda Formation  Kalstad Limestone	Upper Hovin Group sequence Felsic volcanic & volcaniclastic rocks (e. g. Espehaug Rhyolite, Grim- såsen & Hareklett Tuffs; locally includes limestone (e. g. Kalstad Limestone) Voila Conglom- erate <i>Dicranograptus</i> Shale Krokstad Forma- tion	Sandå Group (lower) Tuffaceous sandstone & banded slate Limestone Polymict con- glomerate	Horg Series Sandå Shale Lyngstein Conglom- erate
		UNCONFORMITY	HORG FAULT  (after Bruton & Bockelie 1980)	FAULT	
Arenig-Llanvirn	Nyplassen Beds Fjeldheim Beds (includes Bogo Shale)	Nyplassen For- mation Bogo Formation Løkken Forma- tion Lo Formation	Lower Hovin Group sequence Tuff & conglom- erate (channel fill) "Porphyrite" Hølonða Lime- stone Shale Sandstone Venna Cong- lomerate "Greenstone" complex Base not exposed	Krogstad Group Hølonða Por- phyrite Green-gray graywacke, sandstone, slate & siltstone Gaubakk Breccia Hølonða Lime- stone Lower sand- stone Greenstone conglomerate & breccia	Hovin Series (upper) Hovin Sand- stone Grimsås Rhyo- lite Voila Conglom- erate  Hovin Series (lower) <i>Dicranograptus</i> & Tomme Shales Esphaug Tuff Hareklett Tuff Sundsetkjølen Tuff Svartjern Lime- stone Krokstad sandstone, shale, etc., in- cludes Hølonða Limestone Venna Cong- lomerate
			UNCONFORMITY		
Pre-Arenig	Støren Group			Støren Group	Støren Series

History of stratigraphic nomenclature in the Løkken-Hølonða-Hovin area. Løkken area names in left-hand columns, Hølonða-Hovin names on the right. Candidates for formal recognition in bold face type. Units listed under "Upper Hovin Group sequence" in "This paper" column may include synonyms.

USA and Newfoundland, Canada. Four belong to the genera that are apparently endemic, three of which are new, and one is a species previously described from this area that was recently reported from north-western Ireland (Harper in Harper et al., in print). A few specimens belong to an unnamed species of two cosmopolitan genera. Although trilobites are less numerous and less well preserved than the brachiopods, representatives of 11 genera have been recognized. Excepting *Sphaerocoryphe* (Bruton in Neuman, Bruton, 1974), these also occur in rocks of Whiterock age in Nevada, western Newfoundland, and on Spitsbergen. Conodonts confirm the North American faunal affinities of the Hølonða Limestone and indicate its correlation with the early Middle Ordovician *Anomalorthis* Zone of the Whiterock Stage (or Series) in Nevada (Bergström, 1979).

The Upper Hovin Group sequence appears to be confined to the down-thrown (southeast) side of the Horg fault. These rocks have not been investigated as intensively as those of the Lower Hovin Group. Caradoc and Ashgill-age fossils are known in them from several places within and beyond the area of the Hølonða map-area (Chaloupsky, 1977; Bruton, Bockelie, 1982). East of the Hølonða map-area, the Upper Hovin Group is underlain by greenstone of the Støren Group (Furnes et al., 1985; Stephens, Gee, 1985).

Recognition that the ophiolitic rocks of the Støren Group are older than those of the Løkken Formation, and that the two are petrogenetically distinct (Furnes et al., 1985) have profound implications for determining the paleogeographic settings of the contrasting sedimentary sequences that overlie each of them. These differences confirm the suggestion that the Upper Allochthon of the Scandinavian Caledonides consists of several terranes, two of which are in juxtaposition here. One of these consists of the pre-Arenig Støren Group and the Caradoc-Ashgill Upper Hovin Group cover sequence; the other contains the Arenig-age Løkken Group and the Arenig-Llanvirn Lower Hovin Group cover sequence. The greater allochthoneity of the Lower Hovin Group sequence is indicated by its rocks and fossils, both indicating that they shared the warm-water, low-latitude environment that governed the faunal content and the sedimentation of the Table Head Group on the carbonate bank of the Laurentian miogeocline.

The ophiolitic rocks of the Løkken Group indicate that the sedimentary sequence of the Lower Hovin Group was deposited on oceanic crust (Hølanda terrane of Stephens, Gee, 1985), significantly different from the continental crust that underlies the Table Head Group. Inferences drawn from the rocks and fossils of the Lower Hovin Group and related coeval rocks such as those on Smøla in Norway (Bruton, Bockelie, 1979; Bruton, Harper, 1985), and in the South Mayo trough of northwestern Ireland (Williams, Curry, 1985) suggest that all belong to one or more suspect terranes that originated from within the same low-latitude paleoclimate zone, far from the cooler-water, mid- to high-latitude climate zone of the autochthonous Baltic Ordovician miogeocline.

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Received  
Dec. 14, 1988

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**ALUMISE HOVINI GRUPI (ARENIG/LLANVIRN)  
GEOLOGILINE ASEND HØLONDA PIIRKONNAS,  
SØR TRØNDELAG, NORRA**

Alumise Hovini grupi brahhiopoodide, trilobiitide ja konodontide fauna on valdavalt Põhja-Ameerika päritoluga. See võimaldab korreleerida Hølonnda lubjakivi Whiterocki lademega Nevadas (USA-s).

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**ГЕОЛОГИЧЕСКОЕ ПОЛОЖЕНИЕ НИЖНЕЙ ГРУППЫ ХОВИН  
(АРЕНИГ/ЛЛАНВИРН) В РАЙОНЕ ХЕЛОНДА (СЕР-ТРЁННЕЛАГ, НОРВЕГИЯ)**

Фауна брахиопод, трилобитов и конodontов нижней группы Ховин — преимущественно североамериканского происхождения. Это позволяет коррелировать известняк Хёлонда с горизонтом Уайтрок Невады (США).